

## PATENT ABSTRACTS OF JAPAN

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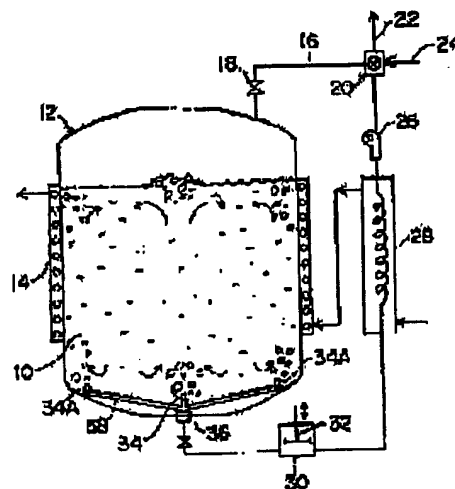
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KASAI MASATAKA

## (54) GAS STIRRING TYPE FERMENTATION STORAGE TANK

## (57)Abstract:

**PURPOSE:** To readily and simply control temperature of stored liquid by extracting a gas in upper space of a tank, controlling the temperature of the extracted gas with a heat exchanger and stirring the stored liquid in the tank by blowing the extracted gas from the lower part of the tank.

**CONSTITUTION:** A gas in the upper space of a tank 12 is led through a gas extraction pipe 18 to a heat exchanger 28 to control the temperature of the extracted gas. The temperature-controlled gas is blown from a nozzle 34 in the lower part of a tank. Thereby, a stored liquid 10 in the tank is stirred to uniformize the temperature and the concentration in the tank and float yeast, etc., in the tank.



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CLAIMS

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## [Claim(s)]

[Claim 1] The gas stirring type fermentation storage tank characterized by enabling stirring of the stock solution in a tank by the extract gas which was equipped with the extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, the heat exchanger which controls the temperature of extract gas, and the nozzle which blows the gas which carried out temperature control from said tank lower part, and was blown from this nozzle.

[Claim 2] the gas which carried out temperature control to the extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, the regulator which adjust the component of extract gas to the gas presentation of arbitration, and the heat exchanger which control the temperature of the gas which adjusted — one time — savings — the gas stirring type fermentation storage tank characterize by to have the \*\* gas machine whose blowdown made possible intermittently, and the nozzle which blow the gas sent out from said \*\* gas machine from the tank lower part.

[Claim 3] The extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, and the regulator which adjusts the component of extract gas to the gas presentation of arbitration, The heat exchanger which controls the temperature of the adjusted gas, and the nozzle which blows the gas which carried out temperature control from the tank lower part. The gas stirring type fermentation storage tank characterized by having airlift tubing which introduces the gas which blows off from said nozzle within said body of a fermentation storage tank, and blows off a gas mixture stock solution towards up space.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to amelioration of the fermentation storage tank used in order to ripe and to store fermentation drinks, such as Biel and wine.

[0002]

[Description of the Prior Art] Conventionally, wooden and a metal tank container are used for the tank which ripens and stores fermentation drinks, such as Biel and wine. In order to ripen a stock solution object, temperature management is important, it puts on the room which carried out air conditioning of the fermentation storage tank from the former for this reason, and by controlling the ambient temperature of that room, the liquid temperature in a tank is controlled, or a water cooled jacket is twisted around a tank and approaches, such as cooling from the outside of a tank, are taken.

[0003]

[Problem(s) to be Solved by the Invention] However, according to the above-mentioned conventional approach, if a fermentation storage tank container becomes large-sized, the ratio of the container surface area to content volume becomes small, and suitable temperature management is becoming difficult gradually. That is, even if it performs temperature management of the room in which a tank is installed, the whole stock solution in a tank will not be able to be managed to uniform temperature, but the temperature gradient which met in the direction of a cross section of a tank will be produced. For this reason, especially, it was not fully managed to the liquid temperature of the core of a stock solution, therefore there was a problem that making tank capacity small etc. had to cope with it by carrying out. Moreover, there was also a possibility that precipitate will arise if fermentation progresses, and the ununiformity on quality might arise.

[0004] Irrespective of tank size, temperature management of a stock solution object is very easy, and is excellent in handling nature, and the purpose of this invention has it in offering the fermentation storage tank which can be installed also in the interior of a room or the outdoors which has not carried out temperature management.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the fermentation storage tank concerning this invention is equipped with the extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, the heat exchanger which controls the temperature of extract gas, and the nozzle which blows the gas which carried out temperature control from said tank lower part, and enables stirring of the stock solution in a tank by the extract gas blown from this nozzle.

[0006] Moreover, the extraction tube with which the fermentation storage tank concerning the 2nd invention extracts the gas of the up space within the body of a fermentation storage tank. The regulator which adjusts the component of extract gas to the gas presentation of arbitration, and the heat exchanger which controls the temperature of the adjusted gas. In order to consider as the configuration equipped with the \*\* gas machine which made possible the blowdown of the gas which carried out temperature control temporarily at the savings intermittent target, and the nozzle which blows the gas sent out from said \*\* gas machine from the tank lower part and to heighten the stirring effectiveness. He is trying to blow off from said tank lower part intermittently, accumulating the gas which carried out temperature control to the \*\* gas container, and putting a pressure.

[0007] The extraction tube with which the fermentation storage tank concerning the 3rd invention extracts the gas of the up space within the body of a fermentation storage tank. The regulator which adjusts the component of extract gas to the gas presentation of arbitration, and the heat exchanger which controls the temperature of the adjusted gas, it has the nozzle which blows the gas which carried out temperature control from the tank lower part, and airlift tubing which introduces the gas which blows off from said nozzle within said body of a fermentation storage tank, and blows off a gas mixture stock solution towards up space. Gas collected on tank up space is taken out out of a tank, and it constitutes so that this may be blown into said airlift tubing lower part, the liquid of a tank pars basilaris ossis occipitalis may be positively raised near an oil level and a liquid may be stirred.

[0008] If pore size uses the porous body which is 30-100 micrometers as a blowing-in nozzle, the air bubbles equivalent to pore size will be generated, and heat exchange will be performed easily. If it carries out from the purpose of stirring, the air bubbles of the diameter of several mm will also demonstrate effectiveness enough.

[0009]

[Function] According to the above-mentioned configuration, the liquid in a tank will be stirred, produces the circulating flow inside a tank body, and equalization of temperature and concentration is promoted by movement of the air bubbles which blow off from a nozzle. Moreover, the yeast which is easy to sediment re-floats with a rise of air bubbles, and a fermentation reaction and an aging reaction advance more smoothly.

[0010] Moreover, after storing extract gas in a \*\* gas machine, by constituting so that it may blow off intermittently on a tank, the magnitude and timing of the amount of blowdown of gas and air bubbles can be adjusted according to the situation in a tank, and fermentation, or stirring and temperature control according to extent of aging become possible. Furthermore, by constituting so that extract gas may be blown using airlift tubing, it accompanies to the gas blown, the liquid of the tank lower part goes up, and it flows on an oil level. While a big stirring style is formed of this, heat exchange of the part for the core of a stock solution is carried out through airlift tubing, and it can make the temperature of the liquid in a tank equalize effectively.

[0011]

[Example] Below, the example of the gas stirring type fermentation storage tank concerning this invention is explained with reference to a drawing at a detail.

[0012] Drawing 1 is the cross-section explanatory view of the gas stirring type fermentation storage tank concerning the 1st example. As shown in this drawing, the gas stirring type fermentation storage tank concerning an example has the tank body 12 which ripens and stores the raw material liquids 10, such as Biel and wine, and has attached in this drum section the jacket 14 which twisted the spiral tube around the peripheral face of a tank body 12, and was formed for the purpose of temperature control or incubation. Such a jacket 14 is formed so that the drum length part which covers the restoration field of the raw material liquid with which the tank body 12 is filled up at least may be covered.

[0013] The raw material liquid 10 can leave up space to the above-mentioned tank body 12, it can be filled up with it, and the fermentation gas which occurs in process of aging can be accumulated now in the up space in a tank body 12. And he establishes

the circulation path which extracts fermentation gas and is returned to the lower part of a tank body 12, and is trying to make fermentation, stirring, and a promotion operation of a heat transfer rate perform by performing aeration processing of the raw material liquid by fermentation gas in the fermentation storage tank concerning this example. For this reason, the gas extraction tube 16 for extracting fermentation gas from the up space in a tank is connected to the top-plate section of a tank body 12. This gas extraction tube 16 is connected to the gas controller 20 through the closing motion valve 18 prepared on the way. Connection of the gas installation piping 24 is enabled on the mainstream way which the gas controller 20 is constituted by the direction change-over valve, and makes change connection of the gas extraction tube 16 at the emission piping 22, or contains the gas extraction tube 16, it can emit from the emission piping 22, or the fresh air which sanitized a part of gas if needed can be added now from the gas installation piping 24.

[0014] A fan 26 is formed in the downstream of such a gas controller 20, and gas is energized by the fan 26 concerned and fed by the heat exchanger 28. A heat exchanger 28 makes predetermined temperature adjust said fermentation gas between the heat exchange media supplied to said tank jacket 14. Moreover, the \*\* gas machine 30 in which the extract gas controlled by the heat exchanger 28 by predetermined temperature is stored temporarily is formed. This was constituted by the piston cylinder device, and when the stored gas reaches a constant rate, it is extruded and supplied with the piston 32, while it stores temporarily the extract gas fed by said fan 26.

[0015] It connects with the nozzle 34 prepared in the pars basilaris ossis occipitalis in a tank body 12, and outlet piping of the \*\*\*\*\* gas machine 30 blows the gas extruded by the drive of the piston 32 of the \*\* gas machine 30 into the raw material liquid 10 intermittently stored from the pars basilaris ossis occipitalis of a tank 10. The liquid raw material in a tank body 12 is rocked, and equalization of temperature and concentration is promoted by movement of the air bubbles which blow off from a nozzle 34 by this. Moreover, the yeast which is easy to sediment re-floats with a rise of air bubbles, and a fermentation reaction and an aging reaction advance more smoothly. The amount of blowdown and timing of gas can be adjusted by controlling the travel of a fan 26 or a piston 32 according to the situation of the liquid raw material 10 in a tank body 12.

[0016] Moreover, in this example, the nozzle 34 attached in the pars basilaris ossis occipitalis of a tank body 12 is attached as follows. That is, the entrainment tube axis 36 of the gas penetrated to a tank body 12 is attached free [ rotation ] from outlet piping of the \*\* gas machine 30, it blows off from the entrainment tube axis 36 to a radial, and piping 38 is branched, and this is arranged so that the base of a tank body 12 may be met. And while attaching the direct nozzle 34 in the entrainment tube axis 36, nozzle 34A is further prepared in the middle of [ its ] the tip of the blowdown piping 38. The direction of the blowdown sets nozzle 34A attached in the blowdown piping 38 as the opposite side horizontal direction of a hand of cut. If gas is made to blow into a tank body 12 by this, the blowdown piping 38 can be rotated along the base of a tank body 12 according to the blowdown reaction force of nozzle 34A, and can stir the liquid near a tank drum section almost continuously. In this case, an impeller can be attached in the blowdown piping 38. It is also possible to, rotate the entrainment tube axis 36 by motorised, of course.

[0017] Thus, in the constituted fermentation storage tank, after it extracts the fermentation gas which occurs from the raw material liquid 10 with which the tank body 12 is filled up and the gas controller 20 adjusts this for a required component, it blows off from the nozzles 34 and 34A which temperature control was carried out and have been arranged in the lower part of a tank body 12. In order that emitted gas may accompany the raw material liquid 10 of a tank pars basilaris ossis occipitalis and may generate upward flow, the raw material liquid 10 will form the circulating flow of the vertical direction within a tank body 12 as a whole. Thereby, as for the temperature and concentration of the raw material liquid 10 in a tank body 12, equalization is promoted by circulation operation. The yeast which is easy to precipitate to coincidence re-floats by rise of air bubbles, and promotes a fermentation reaction and an aging reaction. Since timing can be set as the amount of gas entrainments, and the diameter list of air bubbles at arbitration by making the entrainment of gas possible intermittently with the \*\* gas vessel 30 especially and accommodation according to the fermentation of the raw material liquid 10 and extent of aging can be performed, adjustment of the arbitration of a fermentation drink is possible.

[0018] In addition, by changing the heat capacity of a heat exchanger 28, the temperature of gas changes and temperature of the liquid raw material 10 can be adjusted easily.

[0019] Drawing 2 shows the 2nd example. The fermentation storage tank concerning this 2nd example is covered with heat insulating material, such as a jacket which does not illustrate a tank body 12, like the case of the 1st example. After the gas in a tank body 12 passes along the gas extraction tube 16, adjusts a required component with a gas governor 20 and adjusts temperature by the fan 26 and the heat exchanger 28, he is trying to blow off from the nozzle 40 set as the bottom plate core in a tank body 12. And the nozzle 40 was countered, the airlift tubing 42 is attached centering on the interior of a tank body 12, opening of this is carried out from the oil level of the raw material liquid 10 in the upper part, and the umbrella type diffusion plate 46 with which the downhill grade was attached is formed in the periphery of opening 44. The suspension wall 48 is formed in the inferior surface of tongue of the above-mentioned diffusion plate 46 so that the upper part of the airlift tubing 42 may be surrounded, this forms \*\*\*\*\* 50, and the opening 44 of the airlift tubing 42 is surfaced to the oil-level upper part using buoyancy. Furthermore, the diffusion plate 46 is hanging so that it may become an orientation mostly with the suspension bar 52. Moreover, the lower limit section of the airlift tubing 42 shall be extended, and shall introduce certainly the gas which blows off from said nozzle 40 in the airlift tubing 42. Both are connected by the spacing holder which is not illustrated, and the flexible devices 54, such as bellows, are formed in the nozzle 40 so that it can follow in footsteps of vertical actuation, so that the distance between the airlift tubing 42 and a nozzle 40 may be held uniformly.

[0020] In such the 2nd example, the gas which blows off from a nozzle 40 involves in the liquid raw material 10, while going up the airlift tubing 42, it performs heat exchange, and it comes out of the top opening 44 of the airlift tubing 42. A liquid flows and flows down the front face of the diffusion plate 46 from the circumference. The big revolution style of the vertical direction where the internal liquid 10 of a tank body 12 made airlift tubing 42 the upward flow way is formed of this. Since big circulating flow is formed and temperature distribution are equalized by this even when it is a tank with a large capacity, it can control to temperature with temperature management appropriate also for a difficult tank core, and the variation in the fermentation by equalization of concentration and aging can be abolished.

[0021] In addition, although the \*\* gas machine 20 is omitted in the 2nd example of the above, it cannot be overemphasized that it can prepare in a gas circulation path if needed.

[0022]

[Effect of the Invention] As explained above, in the fermentation storage tank concerning this invention The extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, and the heat exchanger which controls the temperature of extract gas, By having had the nozzle which blows the gas which carried out temperature control from said tank lower part, and having enabled stirring of the stock solution in a tank by the extract gas blown from this nozzle Moreover,

the \*\* gas machine which made possible the blowdown of the gas which carried out temperature control in addition to this temporarily at the savings intermittent target is formed. Or by having considered as airlift tubing which introduces the gas which blows off from said nozzle within the body of a fermentation storage tank, and blows off a gas mixture stock solution towards up space, and the configuration which it had While circulation supply of fermentation gas can perform easily fermentation, or stirring and temperature control according to extent of aging, the outstanding effectiveness that the ambient atmosphere in a tank can be held the optimal is acquired by adjusting the component of gas.

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TECHNICAL FIELD

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[Industrial Application] This invention relates to amelioration of the fermentation storage tank used in order to ripe and to store fermentation drinks, such as Biel and wine.

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PRIOR ART

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[Description of the Prior Art] Conventionally, wooden and a metal tank container are used for the tank which ripens and stores fermentation drinks, such as Blai and wine. In order to ripen a stock solution object, temperature management is important, it puts on the room which carried out air conditioning of the fermentation storage tank from the former for this reason, and by controlling the ambient temperature of that room, the liquid temperature in a tank is controlled, or a water cooled jacket is twisted around a tank and approaches, such as cooling from the outside of a tank, are taken.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] As explained above, in the fermentation storage tank concerning this invention The extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, and the heat exchanger which controls the temperature of extract gas, By having had the nozzle which blows the gas which carried out temperature control from said tank lower part, and having enabled stirring of the stock solution in a tank by the extract gas blown from this nozzle Moreover, the \*\* gas machine which made possible the blowdown of the gas which carried out temperature control in addition to this temporarily at the savings intermittent target is formed. Or by having considered as airlift tubing which introduces the gas which blows off from said nozzle within the body of a fermentation storage tank, and blows off a gas mixture stock solution towards up space, and the configuration which it had While circulation supply of fermentation gas can perform easily fermentation, or stirring and temperature control according to extent of aging, the outstanding effectiveness that the ambient atmosphere in a tank can be held the optimal is acquired by adjusting the component of gas.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, according to the above-mentioned conventional approach, if a fermentation storage tank container becomes large-sized, the ratio of the container surface area to content volume becomes small, and suitable temperature management is becoming difficult gradually. That is, even if it performs temperature management of the room in which a tank is installed, the whole stock solution in a tank will not be able to be managed to uniform temperature, but the temperature gradient which met in the direction of a cross section of a tank will be produced. For this reason, especially, it was not fully managed to the liquid temperature of the core of a stock solution, therefore there was a problem that making tank capacity small etc. had to cope with it by carrying out. Moreover, there was also a possibility that precipitate will arise if fermentation progresses, and the ununiformity on quality might arise.

[0004] Irrespective of tank size, temperature management of a stock solution object is very easy, and is excellent in handling nature, and the purpose of this invention has it in offering the fermentation storage tank which can be installed also in the interior of a room or the outdoors which has not carried out temperature management.

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MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, the fermentation storage tank concerning this invention is equipped with the extraction tube which extracts the gas of the up space within the body of a fermentation storage tank, the heat exchanger which controls the temperature of extract gas, and the nozzle which blows the gas which carried out temperature control from said tank lower part, and enables stirring of the stock solution in a tank by the extract gas blown from this nozzle.

[0006] Moreover, the extraction tube with which the fermentation storage tank concerning the 2nd invention extracts the gas of the up space within the body of a fermentation storage tank, The regulator which adjusts the component of extract gas to the gas presentation of arbitration, and the heat exchanger which controls the temperature of the adjusted gas, In order to consider as the configuration equipped with the \*\* gas machine which made possible the blowdown of the gas which carried out temperature control temporarily at the savings intermittent target, and the nozzle which blows the gas sent out from said \*\* gas machine from the tank lower part and to heighten the stirring effectiveness He is trying to blow off from said tank lower part intermittently, accumulating the gas which carried out temperature control to the \*\* gas container, and putting a pressure.

[0007] The extraction tube with which the fermentation storage tank concerning the 3rd invention extracts the gas of the up space within the body of a fermentation storage tank, The regulator which adjusts the component of extract gas to the gas presentation of arbitration, and the heat exchanger which controls the temperature of the adjusted gas, It has the nozzle which blows the gas which carried out temperature control from the tank lower part, and airlift tubing which introduces the gas which blows off from said nozzle within said body of a fermentation storage tank, and blows off a gas mixture stock solution towards up space. Gas collected on tank up space is taken out out of a tank, and it constitutes so that this may be blown into said airlift tubing lower part, the liquid of a tank pars basilaris ossis occipitalis may be positively raised near an oil level and a liquid may be stirred.

[0008] If pore size uses the porous body which is 30-100 micrometers as a blowing-in nozzle, the air bubbles equivalent to pore size will be generated, and heat exchange will be performed easily. If it carries out from the purpose of stirring, the air bubbles of the diameter of several mm will also demonstrate effectiveness enough.

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**OPERATION**

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[Function] According to the above-mentioned configuration, the liquid in a tank will be stirred, produces the circulating flow inside a tank body, and equalization of temperature and concentration is promoted by movement of the air bubbles which blow off from a nozzle. Moreover, the yeast which is easy to sediment re-floats with a rise of air bubbles, and a fermentation reaction and an aging reaction advance more smoothly.

[0010] Moreover, after storing extract gas in a \*\* gas machine, by constituting so that it may blow off intermittently on a tank, the magnitude and timing of the amount of blowdown of gas and air bubbles can be adjusted according to the situation in a tank, and fermentation, or stirring and temperature control according to extent of aging become possible. Furthermore, by constituting so that extract gas may be blown using airlift tubing, it accompanies to the gas blown, the liquid of the tank lower part goes up, and it flows on an oil level. While a big stirring style is formed of this, heat exchange of the part for the core of a stock solution is carried out through airlift tubing, and it can make the temperature of the liquid in a tank equalize effectively.

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## EXAMPLE

[Example] Below, the example of the gas stirring type fermentation storage tank concerning this invention is explained with reference to a drawing at a detail.

[0012] Drawing 1 is the cross-section explanatory view of the gas stirring type fermentation storage tank concerning the 1st example. As shown in this drawing, the gas stirring type fermentation storage tank concerning an example has the tank body 12 which stores the raw material liquids 10, such as Beer and wine, and has attached in this drum section the jacket 14 which twisted the spiral tube around the peripheral face of a tank body 12, and was formed for the purpose of temperature control or incubation. Such a jacket 14 is formed so that the drum length part which covers the fermentation field of the raw material liquid with which the tank body 12 is filled up at least may be covered.

[0013] The raw material liquid 10 can leave up space to the above-mentioned tank body 12, it can be filled up with it, and the fermentation gas which occurs in process of aging can be accumulated now in the up space in a tank body 12. And he establishes the circulation path which extracts fermentation gas and is returned to the lower part of a tank body 12, and is trying to make fermentation, stirring, and a promotion operation of a heat transfer rate perform by performing aeration processing of the raw material liquid by fermentation gas in the fermentation storage tank concerning this example. For this reason, the gas extraction tube 16 for extracting fermentation gas from the up space in a tank is connected to the top-plate section of a tank body 12. This gas extraction tube 16 is connected to the gas controller 20 through the closing motion valve 18 prepared on the way. Connection of the gas installation piping 24 is enabled on the mainstream way which the gas controller 20 is constituted by the direction change-over valve, and makes change connection of the gas extraction tube 16 at the emission piping 22, or contains the gas extraction tube 16, it can emit from the emission piping 22, or the fresh air which sanitized a part of gas if needed can be added now from the gas installation piping 24.

[0014] A fan 26 is formed in the downstream of such a gas controller 20, and gas is energized by the fan 26 concerned and fed by the heat exchanger 28. A heat exchanger 28 makes predetermined temperature adjust said fermentation gas between the heat exchange media supplied to said tank jacket 14. Moreover, the \*\* gas machine 30 in which the extract gas controlled by the heat exchanger 28 by predetermined temperature is stored temporarily is formed. This was constituted by the piston cylinder device, and when the stored gas reaches a constant rate, it is extruded and supplied with the piston 32. while it stores temporarily the extract gas fed by said fan 26.

[0015] It connects with the nozzle 34 prepared in the pars basilaris ossis occipitalis in a tank body 12, and outlet piping of the \*\*\*\* gas machine 30 blows the gas extruded by the drive of the piston 32 of the \*\* gas machine 30 into the raw material liquid 10 intermittently stored from the pars basilaris ossis occipitalis of a tank 10. The liquid raw material in a tank body 12 is rocked, and equalization of temperature and concentration is promoted by movement of the air bubbles which blow off from a nozzle 34 by this. Moreover, the yeast which is easy to sediment re-floats with a rise of air bubbles, and a fermentation reaction and an aging reaction advance more smoothly. The amount of blowdown and timing of gas can be adjusted by controlling the travel of a fan 26 or a piston 32 according to the situation of the liquid raw material 10 in a tank body 12.

[0016] Moreover, in this example, the nozzle 34 attached in the pars basilaris ossis occipitalis of a tank body 12 is attached free [ rotation ] from outlet piping of the \*\* gas machine 30, it blows off from the entrainment tube axis 36 to a radial, and piping 38 is branched, and this is arranged so that the base of a tank body 12 may be met. And while attaching the direct nozzle 34 in the entrainment tube axis 36, nozzle 34A is further prepared in the middle of [ its ] the tip of the blowdown piping 38. The direction of the blowdown sets nozzle 34A attached in the blowdown piping 38 as the opposite side horizontal direction of a hand of cut. If gas is made to blow into a tank body 12 by this, the blowdown piping 38 can be rotated along the base of a tank body 12 according to the blowdown reaction force of nozzle 34A, and can stir the liquid near a tank drum section almost continuously. In this case, an impeller can be attached in the blowdown piping 38. It is also possible to, rotate the entrainment tube axis 36 by motorised, of course.

[0017] Thus, in the constituted fermentation storage tank, after it extracts the fermentation gas which occurs from the raw material liquid 10 with which the tank body 12 is filled up and the gas controller 20 adjusts this for a required component, it blows off from the nozzles 34 and 34A which temperature control was carried out and have been arranged in the lower part of a tank body 12. In order that emitted gas may accompany the raw material liquid 10 of a tank pars basilaris ossis occipitalis and may generate upward flow, the raw material liquid 10 will form the circulating flow of the vertical direction within a tank body 12 as a whole. Thereby, as for the temperature and concentration of the raw material liquid 10 in a tank body 12, equalization is promoted by circulation operation. The yeast which is easy to precipitate to coincidence re-floats by rise of air bubbles, and promotes a fermentation reaction and an aging reaction. Since timing can be set as the amount of gas entrainments, and the diameter list of air bubbles at arbitration by making the entrainment of gas possible intermittently with the \*\* gas vessel 30 especially and accommodation according to the fermentation of the raw material liquid 10 and extent of aging can be performed, adjustment of the arbitration of a fermentation drink is possible.

[0018] In addition, by changing the heat capacity of a heat exchanger 28, the temperature of gas changes and temperature of the liquid raw material 10 can be adjusted easily.

[0019] Drawing 2 shows the 2nd example. The fermentation storage tank concerning this 2nd example is covered with heat insulating material, such as a jacket which does not illustrate a tank body 12, like the case of the 1st example. After the gas in a tank body 12 passes along the gas extraction tube 16, adjusts a required component with a gas governor 20 and adjusts temperature by the fan 26 and the heat exchanger 28, he is trying to blow off from the nozzle 40 set as the bottom plate core in a tank body 12. And the nozzle 40 was countered, the airlift tubing 42 is attached centering on the interior of a tank body 12, opening of this is carried out from the oil level of the raw material liquid 10 in the upper part, and the umbrella type diffusion plate 46 with which the downhill grade was attached is formed in the periphery of opening 44. The suspension wall 48 is formed in the inferior surface of tongue of the above-mentioned diffusion plate 46 so that the upper part of the airlift tubing 42 may be surrounded, this forms \*\*\*\*\* 50, and the opening 44 of the airlift tubing 42 is surfaced to the oil-level upper part using buoyancy. Furthermore, the diffusion plate 46 is hanging so that it may become an orientation mostly with the suspension bar 52. Moreover, the lower limit section of the airlift tubing 42 shall be extended, and shall introduce certainly the gas which blows off from said nozzle 40 in the airlift tubing 42. Both are connected by the spacing holder which is not illustrated, and the flexible devices 54, such as bellows, are formed in the nozzle 40 so that it can follow in footsteps of vertical actuation, so that the distance between the airlift tubing 42 and a nozzle 40 may be held uniformly.

[0020] In such the 2nd example, the gas which blows off from a nozzle 40 involves in the liquid raw material 10, while going up the airlift tubing 42, it performs heat exchange, and it comes out of the top opening 44 of the airlift tubing 42. A liquid flows and flows down the front face of the diffusion plate 46 from the circumference. The big revolution style of the vertical direction where the internal liquid 10 of a tank body 12 made airlift tubing 42 the upward flow way is formed of this. Since big circulating flow is formed and temperature distribution are equalized by this even when it is a tank with a large capacity, it can control to temperature with temperature management appropriate also for a difficult tank core, and the variation in the fermentation by equalization of concentration and aging can be abolished.

[0021] In addition, although the \*\* gas machine 20 is omitted in the 2nd example of the above, it cannot be overemphasized that it can prepare in a gas circulation path if needed.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the fermentation storage tank concerning the 1st example of this invention.

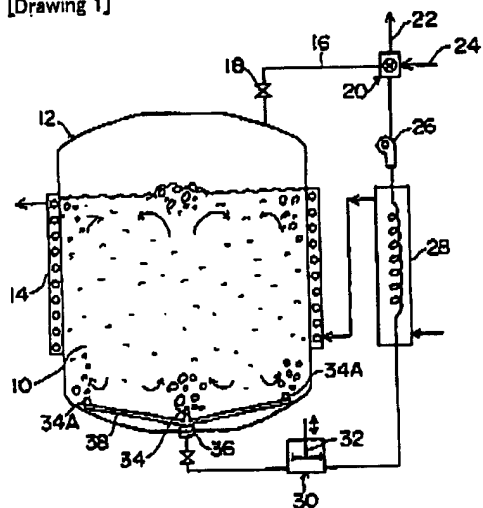
[Drawing 2] It is the sectional view of the tank concerning this 2nd example.

[Description of Notations]

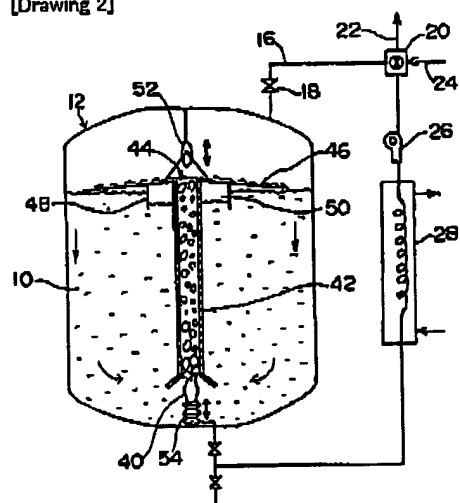
- 10 Raw Material Liquid
  - 12 Tank Body
  - 14 Jacket
  - 16 Gas Extraction Tube
  - 18 Closing Motion Valve
  - 20 Gas Controller
  - 22 Emission Piping
  - 24 Gas Installation Piping
  - 26 Fan
  - 28 Heat Exchanger
  - 30 \*\* Gas Machine
  - 32 Piston
  - 34 34A Nozzle
  - 36 Entrainment Tube Axis
  - 38 Blowdown Piping
  - 40 Nozzle
  - 42 Airlift Tubing
  - 44 Opening
  - 46 Diffusion Plate
  - 48 Suspension Wall
  - 50 \*\*\*\*\*
  - 52 Suspension Bar
  - 54 Flexible Device
-

**[Drawing 1]**

**[Drawing 1]**



**[Drawing 2]**



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特開平6-121666

(43)公開日 平成6年(1994)5月6日

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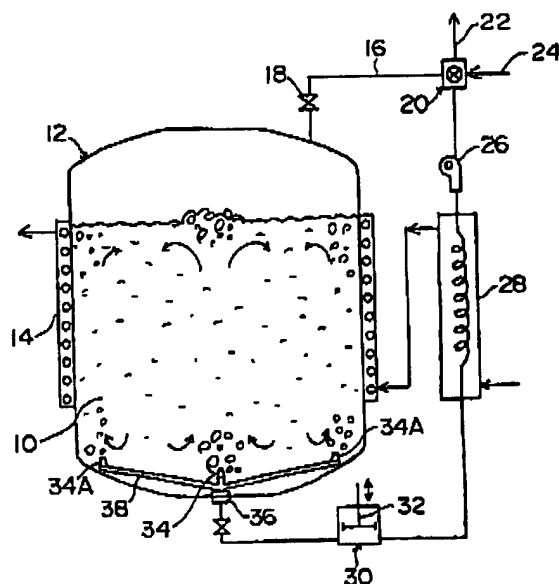
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(54)【発明の名称】 ガス攪拌式発酵貯蔵タンク

(57)【要約】

【目的】 タンクサイズに拘らず貯蔵液体の温度管理が非常に容易であって、取扱い性に優れ、屋外にも設置することの出来る発酵貯蔵タンクを得る。

【構成】 発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの温度を制御する熱交換器と、温度制御したガスを前記タンク下部から吹込むノズルとを備え、このノズルから吹込まれた抽出ガスによりタンク内貯蔵液を攪拌可能とした。また、これに加えて温度制御したガスを一時蓄え間欠的に吹き出し可能とした蓄ガス器を設けるようにし、あるいは、発酵貯蔵タンク本体内部にて前記ノズルから吹出されるガスを導入し上部空間に向けてガス混合貯蔵液を吹出すエアリフト管と備えた構成とする。





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## 【特許請求の範囲】

【請求項1】 発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの温度を制御する熱交換器と、温度制御したガスを前記タンク下部から吹込むノズルとを備え、このノズルから吹込まれた抽出ガスによりタンク内貯蔵液を攪拌可能としたことを特徴とするガス攪拌式発酵貯蔵タンク。

【請求項2】 発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの成分を任意のガス組成に調整する調整器と、調整したガスの温度を制御する熱交換器と、温度制御したガスを一時蓄え間欠的に吹き出し可能とした蓄ガス器と、前記蓄ガス器から送り出されたガスをタンク下部から吹込むノズルとを備えたことを特徴とするガス攪拌式発酵貯蔵タンク。

【請求項3】 発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの成分を任意のガス組成に調整する調整器と、調整したガスの温度を制御する熱交換器と、温度制御したガスをタンク下部から吹込むノズルと、前記発酵貯蔵タンク本体内部にて前記ノズルから吹出されるガスを導入し上部空間に向けてガス混合貯蔵液を吹出すエアリフト管とを備えたことを特徴とするガス攪拌式発酵貯蔵タンク。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明はビール、ワイン等の発酵飲料を熟成、貯蔵するために用いられる発酵貯蔵タンクの改良に関する。

## 【0002】

【従来の技術】 従来、ビール、ワイン等の発酵飲料を熟成、貯蔵するタンクには、木製、金属製のタンク容器が使われている。貯蔵液体を熟成させるために温度管理が重要であり、このため従来から発酵貯蔵タンクを空気調和した部屋に置き、その部屋の雰囲気温度を制御することによってタンク内の液体温度を制御したり、タンクに水冷ジャケットを巻きつけてタンク外から冷やすなどの方法がとられている。

## 【0003】

【発明が解決しようとする課題】 しかしながら、上記従来の方法によれば、発酵貯蔵タンク容器が大型になると内容積に対する容器表面積の比率が小さくなり、適切な温度管理は次第に難しくなっている。すなわち、タンクが設置される部屋の温度管理を行っても、タンク内の貯蔵液全体を均一な温度に管理することができず、タンクの断面方向に沿った温度勾配を生じてしまう。このため、特に貯蔵液の中心部の液体温度まで十分に管理されず、したがって、タンク容量を小さくする等して対処しなければならないという問題があった。また、発酵が進むと沈殿物が生じ、品質上の不均一が生じたりするおそれもあった。

【0004】 本発明の目的は、タンクサイズに拘らず貯

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蔵液体の温度管理が非常に容易であって、取扱性に優れ、温度管理をしていない室内ないしは屋外にも設置することの出来る発酵貯蔵タンクを提供することにある。

## 【0005】

【課題を解決するための手段】 上記目的を達成するために、本発明に係る発酵貯蔵タンクは、発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの温度を制御する熱交換器と、温度制御したガスを前記タンク下部から吹込むノズルとを備え、このノズルから吹込まれた抽出ガスによりタンク内貯蔵液を攪拌可能としたものである。

【0006】 また、第2の発明に係る発酵貯蔵タンクは、発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの成分を任意のガス組成に調整する調整器と、調整したガスの温度を制御する熱交換器と、温度制御したガスを一時蓄え間欠的に吹き出し可能とした蓄ガス器と、前記蓄ガス器から送り出されたガスをタンク下部から吹込むノズルとを備えた構成とし、攪拌効果を高めるために、蓄ガス容器に温度制御したガスを溜めて、圧力をかけて前記タンク下部から間欠的に吹き出すようにしている。

【0007】 第3の発明に係る発酵貯蔵タンクは、発酵貯蔵タンク本体内の上部空間のガスを抽出する抽出管と、抽出ガスの成分を任意のガス組成に調整する調整器と、調整したガスの温度を制御する熱交換器と、温度制御したガスをタンク下部から吹込むノズルと、前記発酵貯蔵タンク本体内部にて前記ノズルから吹出されるガスを導入し上部空間に向けてガス混合貯蔵液を吹出すエアリフト管とを備え、タンク上部空間に溜まったガスをタンク外に取り出し、これを前記エアリフト管下部に吹き込みタンク底部の液体を積極的に液面付近に上昇させて液体を攪拌するように構成している。

【0008】 吹込みノズルとして、ポアサイズが30～100 $\mu$ mの多孔質体を使用すると、ポアサイズに相当する気泡が発生し、熱交換が容易に行われる。攪拌の目的からすれば、数mm径の気泡でも充分効果を発揮する。

## 【0009】

【作用】 上記構成によれば、ノズルから吹き出される気泡の運動により、タンク内の液体は攪拌されることになり、タンク本体内部での循環流を生じて温度及び濃度の均一化が助長される。また、沈降しやすい酵母等は気泡の上昇に伴い再浮遊し、発酵反応や熟成反応がよりスムーズに進行する。

【0010】 また、抽出ガスを蓄ガス器に繋げてからタンクに間欠的に吹き出すように構成することによって、ガスの吹き出し量、気泡の大きさおよびタイミングをタンク内の状況に応じて調節することができ、発酵または熟成の程度に応じた攪拌や温度制御が可能となる。更に、エアリフト管を用いて抽出ガスを吹き込むように構

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成することによって、吹き込まれるガスに随伴してタンク下部の液体が上昇し、液面上に流動する。これによって大きな攪拌流が形成されるとともに、貯蔵液の中心部分はエアリフト管を介して熱交換され、タンク内液体の温度を効果的に均一化させることができるのである。

【0011】

【実施例】以下に、本発明に係るガス攪拌式発酵貯蔵タンクの実施例を図面を参照して詳細に説明する。

【0012】図1は第1実施例に係るガス攪拌式発酵貯蔵タンクの断面説明図である。この図に示されるように、実施例に係るガス攪拌式発酵貯蔵タンクは、ビール、ワイン等の原料液体10を熟成、貯蔵するタンク本体12を有しており、この胴部には温度制御又は保温の目的でタンク本体12の外周面に螺旋チューブを巻き付けて形成されたジャケット14を取り付けている。このようなジャケット14は少なくともタンク本体12に充填されている原料液体の充填領域をカバーする胴長部分を覆うように形成されている。

【0013】原料液体10は上記タンク本体12に上部空間を残して充填されており、熟成の過程で発生する発酵ガスをタンク本体12内の上部空間に溜めることができるようになっている。そして、この実施例に係る発酵貯蔵タンクでは発酵ガスを抽出してタンク本体12の下部に戻す循環経路を設け、発酵ガスによる原料液体の曝気処理を行うことによって発酵、攪拌、熱伝達速度の促進作用を行わせるようにしている。このため、タンク本体12の天板部にはタンク内上部空間から発酵ガスを抽出するためのガス抽出管16が接続されている。このガス抽出管16は途中に設けた開閉弁18を介してガス調節器20に接続されている。ガス調節器20は方向切換弁によって構成されており、ガス抽出管16を放出配管22に切換え接続し、あるいはガス抽出管16を含む主流路にガス導入配管24を接続可能にしており、必要に応じてガスの一部を放出配管22から放出したり、又は無菌化した新鮮空気をガス導入配管24から添加することができるようになっている。

【0014】このようなガス調節器20の下流側にはファン26が設けられ、ガスは当該ファン26で付勢され、熱交換器28に送給される。熱交換器28は前記タンクジャケット14に供給される熱交換媒体との間で前記発酵ガスを所定温度に調節させるものとなっている。また、熱交換器28によって所定の温度に制御された抽出ガスを一時的に蓄える蓄ガス器30が設けられている。これはピストンシリンダ機構によって構成されたもので、前記ファン26によって圧送されてくる抽出ガスを一時的に蓄えると同時に、蓄えたガスが一定量に達した時点でピストン32によって押出し供給するものとなっている。

【0015】上記蓄ガス器30の出口配管はタンク本体12内の底部に設けられたノズル34に接続され、蓄ガ

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ス器30のピストン32の駆動によって押出されたガスを間欠的にタンク10の底部から貯蔵されてる原料液体10内に吹き込むようになっている。これによりノズル34から吹き出される気泡の運動により、タンク本体12内の液体原料は撹動し、温度及び濃度の均一化が助長される。また、沈降しやすい酵母等は気泡の上昇に伴い再浮遊し、発酵反応や熟成反応がよりスムーズに進行する。ガスの吹き出し量及びタイミングは、タンク本体12内の液体原料10の状況に応じて、ファン26又はピストン32の作動量を制御することにより調整することができる。

【0016】また、この実施例ではタンク本体12の底部に取り付けられるノズル34は次のように取り付けられている。すなわち、蓄ガス器30の出口配管からタンク本体12に貫通されるガスの吹き込み管軸36を回動自在に取り付けておき、吹き込み管軸36から放射状に吹き出し配管38を分岐させて、これをタンク本体12の底面に沿うように配置する。そして、吹き込み管軸36に直接ノズル34をとりつけるとともに、吹き出し配管38の先端もしくはその途中に更にノズル34Aを設ける。吹き出し配管38に取り付けたノズル34Aは吹き出し方向が回転方向の反対側水平方向に設定しておく。これによってガスをタンク本体12内に吹き込めると、吹き出し配管38はノズル34Aの吹き出し反力によってタンク本体12の底面に沿って回転し、タンク胴部付近の液体の攪拌をほぼ連続的に行うことができる。この場合、吹き出し配管38に攪拌羽根を取り付けるようにすることもできる。もちろん吹き込み管軸36をモータ駆動によって回転させることも可能である。

【0017】このように構成された発酵貯蔵タンクでは、タンク本体12に充填されている原料液体10から発生する発酵ガスを抽出し、これをガス調節器20によって必要な成分に調整した後、温度調節されてタンク本体12の下部に配置したノズル34、34Aから吹き出す。吹き出されたガスはタンク底部の原料液体10を随伴して上昇流を生成するため、原料液体10は全体としてタンク本体12内で上下方向の循環流を形成することになる。これにより、タンク本体12内の原料液体10の温度や濃度は循環作用によって均一化が助長される。同時に沈殿し易い酵母等は気泡の上昇により再浮遊し、発酵反応や熟成反応を促進させるものとなる。特に、蓄ガス器30により間欠的にガスを吹き込み可能とすることによって、ガス吹き込み量と気泡径並びにタイミングを任意に設定することができ、原料液体10の発酵、熟成の程度に応じた調節ができるので、発酵飲料の任意の調整が可能である。

【0018】なお、熱交換器28の熱容量を変えることにより、ガスの温度が変化し、液体原料10の温度の調節が容易に行える。

【0019】図2は第2実施例を示している。この第2

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実施例に係る発酵貯蔵タンクは、第1実施例の場合と同様に、タンク本体12を図示しないジャケット等の保温材で被覆されている。タンク本体12内のガスはガス抽出管16を通り、ガス調整器20で必要な成分の調整をし、ファン26、熱交換器28で温度を調節した後、タンク本体12内の底板中心部に設定されたノズル40から吹き出すようにしている。そして、ノズル40に対向してタンク本体12の内部中心にエアリフト管42を取り付けており、これは原料液体10の液面より上方にて開口され、開口部44の外周には下り勾配が付けられた傘型の拡散板46が設けられている。エアリフト管42の上部を取囲むように上記拡散板46の下面には垂下壁48が設けられ、これにより気体溜り50を形成し、浮力を利用してエアリフト管42の開口部44を液面上方に浮上させている。更に拡散板46は懸垂バー52によってほぼ定位置となるように懸垂されている。また、エアリフト管42の下端部は拡開され、前記ノズル40から吹き出されるガスをエアリフト管42内に確実に導入し得るものとしている。エアリフト管42とノズル40の間の距離が一定に保持されるよう、両者は図示しない間隔保持具により連結され、ノズル40には上下動作に追随できるよう蛇腹などの伸縮機構54が設けられている。

【0020】このような第2実施例では、ノズル40から吹き出されるガスは液体原料10を巻き込み、エアリフト管42を上昇する間に熱交換を行い、エアリフト管42の頂部開口部44から出る。液体は拡散板46の表面を流れ、周辺から流下する。これによってタンク本体12の内部液体10はエアリフト管42を上昇流路とした上下方向の大きな旋回流が形成される。これにより容量が大きいタンクの場合でも、大きな循環流が形成されて温度分布が均一化されるので、温度管理が困難なタンク中心部も適切な温度に制御することができ、かつ濃度の均一化による発酵、熟成のバラツキをなくすることができる。

【0021】なお、上記第2実施例では蓄ガス器20を省略しているが、必要に応じてガス循環経路に設けることができるのはいうまでもない。

【0022】

【発明の効果】以上説明したように、本発明に係る発酵貯蔵タンクでは、発酵貯蔵タンク本体内の上部空間のガ

スを抽出する抽出管と、抽出ガスの温度を制御する熱交換器と、温度制御したガスを前記タンク下部から吹込むノズルとを備え、このノズルから吹込まれた抽出ガスによりタンク内貯蔵液を攪拌可能としたことにより、また、これに加えて温度制御したガスを一時蓄え間欠的に吹き出し可能とした蓄ガス器を設けるようにし、あるいは、発酵貯蔵タンク本体内に前記ノズルから吹出されるガスを導入し上部空間に向けてガス混合貯蔵液を吹出すエアリフト管と備えた構成としたことにより、発酵ガスの循環供給によって発酵又は熟成の程度に応じた攪拌や温度制御を容易に行うことができるとともに、ガスの成分を調整することにより、タンク内雰囲気最適に保持することができるという優れた効果が得られる。

【図面の簡単な説明】

【図1】本発明の第1実施例に係る発酵貯蔵タンクの断面図である。

【図2】同第2実施例に係るタンクの断面図である。

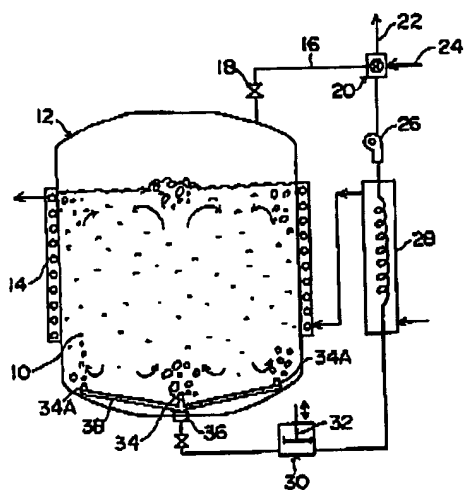
【符号の説明】

10	原料液体
12	タンク本体
14	ジャケット
16	ガス抽出管
18	開閉弁
20	ガス調整器
22	放出配管
24	ガス導入配管
26	ファン
28	熱交換器
30	蓄ガス器
32	ピストン
34、34A	ノズル
36	吹き込み管軸
38	吹き出し配管
40	ノズル
42	エアリフト管
44	開口部
46	拡散板
48	垂下壁
50	気体溜り
52	懸垂バー
54	伸縮機構

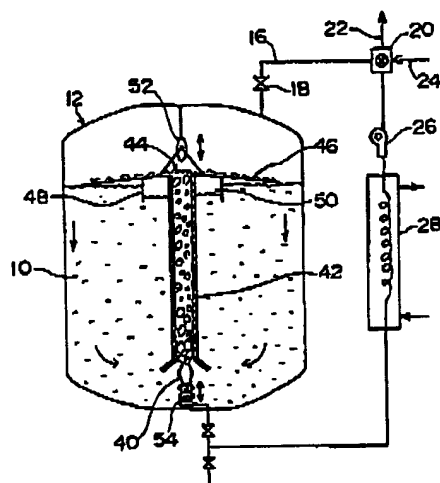
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【図1】



【図2】



フロントページの続き

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- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
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- ☐ **OTHER: \_\_\_\_\_**

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